Title: Family in the spotlight: a systematic review of family factors associated with participation of children with disabilities

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Abstract

AIM The aim of this review was to synthesise empirical evidence of family factors associated with participation of children with disabilities aged 5-12 years to inform the development of family-centred participation-fostering interventions.

METHOD A systematic search was performed for articles published in English between 2001 and 2017 in MEDLINE, PsycINFO, CINAHL, Scopus and ASSIA following the Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines (registration no: CRD42017078202). Quality of evidence was appraised using the Research Triangle Institute Item Bank. Family factors associated with participation were identified and assessed using a multistage "semi-quantitative" approach.

RESULTS Thirty studies were included in the review. Four non-modifiable "status" factors consistently associated with participation were parental ethnicity, parental education, family type and family socio-economic status. Six modifiable "process" factors with consistent associations with participation were parental mental and physical health functioning, parental self-efficacy beliefs, parental support, parental time, family preferences and activity orientation.

INTERPRETATION Rehabilitation professionals should direct their focus towards modifiable family factors as primary targets for family-centred interventions. Strategies that can improve families' access to information, counselling, and community support services are likely to support children's participation by empowering families and optimizing their health and well-being.

Keywords: disability, child, participation, family factors, review

What this paper adds

- Non-modifiable “status” and modifiable “process” factors are important in participation of children with disabilities.
- Disadvantaged family circumstances shaped by “status” factors are associated with reduced participation.
- Key “process” factors for intervention are parental mental and physical health functioning, parental self-efficacy beliefs, parental support, parental time, and family preferences and activity orientation.

The benefits of participation for physical and psychological health and well-being of children with disabilities are well-established.[1, 2] Participation, broadly defined as "involvement in a life situation",[3] is linked to children's growth and development, and enables experiences of meaning and purpose.[1, 4, 5] Optimising participation of children with disabilities is an outcome desired by parents[6, 7] and a primary goal of rehabilitation services.[5] However, children with disabilities participate less frequently and in a narrower range of activities, and are generally less involved when they do participate compared to their peers without disabilities.[7-10] As a result, children with disabilities may lack the benefits linked to participation.

The need to identify effective interventions to foster children's participation is an urgent priority. Better knowledge about factors contributing to children's participation and interdependencies between them is central for informing participation-fostering interventions. Previous reviews have examined personal and environmental factors that affect participation of children with disabilities.[11-17] The most commonly identified factors were child age, gender, skills and functional abilities, preferences and enjoyment, parental values and preferences, supports and acceptance from others and accessibility of physical environment.[11-17] However, these reviews have described the influence of a wide range of factors on participation in specific activities [11, 15, 17] or settings,[14] focused predominantly on children with physical disabilities[11, 13, 15, 17] or provided a narrative evaluation of the findings.[11, 13-16]

Skills and competences shape participation and are shaped by participation in safe and supportive life situations.[4] Family plays a central role in facilitating children's skills and competence development.[4, 18-20] During middle childhood (defined as ages 5 to 12), a child's mastery of developmental challenges is strongly influenced by family experiences and dynamics of relationships among family members.[21, 22] Differences in family experiences

produce important variations in children's participation, which affect children's life experiences in and beyond this developmental period.[21, 22] It is thus important to focus on the family unit and better understand family/parental factors contributing to children's participation,[23, 24] especially in middle childhood. Better knowledge about family factors consistently associated with participation of children with disabilities will support the development of participation-fostering family-centred interventions. The current review therefore aimed: (a) to offer an up-to-date, targeted synthesis of empirical evidence of family factors associated with participation, and (b) to assess the relative strength and consistency of these associations in children with disabilities aged 5-12.

METHOD

The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guideline[25] was used for this review. A protocol was developed a priori and published in the database of prospectively registered systematic reviews (www.crd.york.ac.uk/PROSPERO), registration number: CRD42017078202.

Search strategy and screening

A systematic search was performed by a single researcher (SA) for articles published in English between 2001 and September 2017 in MEDLINE (EBSCO), PsycINFO (EBSCO), CINAHL (EBSCO), Scopus (ProQuest) and ASSIA (ProQuest). Restrictions to the publication date were applied to capture the literature reflective of the WHO's ICF-CY's[3] conceptualisation of participation as a health indicator influenced by a dynamic interaction between multiple factors unique to the child and the attitudinal, social and physical environment. Search terms were determined following the detailed assessment of indexing terms applied to a "known" set of articles meeting inclusion criteria for the review[26] and

finalised with an information specialist. A combination of subject headings and free-text terms for disability, age of participants, participation, family factors and study design was applied. Detailed search strategy for MEDLINE is supplied (Supplementary Figure 1). Additional studies were identified by a manual search of the reference lists of included articles and contents pages of Developmental Medicine and Child Neurology, Archives of Physical Medicine and Rehabilitation, Disability and Rehabilitation, Child: Care, Health and Development, Research in Developmental Disabilities published from January 2012-September 2017.

Initial electronic search results (n=2547) were transferred to Reference Manager Professional Version 11.0. After removal of duplicates, 1532 titles and abstracts were screened for relevance by two independent researchers (SA and EC), resulting in 40 full-text articles retrieved for further eligibility assessment. Twenty-five articles corresponding to 21 individual studies met the inclusion criteria. Discrepancies in the agreement were resolved by consensus. A manual search identified additional nine studies (Figure 1).

Please insert Figure 1 here

Articles were limited to peer-reviewed publications in English aiming to establish relationship between family factors and participation of children with disabilities aged 5–12 (M_{age} <12y). Presence of disability was identified through diagnosis presented in the article or identification of other health or educational support provisions. To ensure inclusion of a wide range of articles, the ICF-CY's conceptualisation of participation as child's "involvement in child-relevant life situations" was applied. Articles that considered known participation measures or in which participation items captured any combination of the ICF-

CY's nine Activities and Participation domains[3] were included. Family factors were defined as factors pertinent to the parents or family unit as a whole including any sociodemographic, psychological, behavioural and parental health related factors. Only observational studies (i.e. prospective and retrospective cohort, case-control, cross-sectional) that reported quantitative evidence on associations of interest were included. Articles were excluded if they focused only on: (a) typically developing children, (b) wider community (e.g. neighbours or peers), (c) children's quality of life, behavioural difficulties, or (d) results were from case studies, conference poster, commentary or other grey literature.

Data extraction

Data extraction was performed using a standardised, pre-piloted data extraction form by two researchers (SA and EC) independently. The following details were extracted: (a) generic information: study author(s), years of publication, (b) data describing study aims, design and population, (c) details on family factors and participation outcome explored (i.e. activity types, settings, dimensions), (d) study results and information for the assessment of the risk of bias. For studies including both children with and without disabilities of a wider age group, results pertinent to children with disabilities in the targeted age group were extracted unless no segregation of findings based on disability status and age group was provided.

Quality appraisal

Quality appraisal was performed by two independent researchers (SA and EC) using the adapted version of the Research Triangle Institute Item Bank (RTI-IB).[27] The RTI-IB captures all the domains critical for evaluating observational studies and allows customisation from the investigator based on research needs. The RTI-IB has high inter-rater reliability[27] and has been previously used to assess the risk of bias and precision of observational

studies.[28, 29] The original RTI 29-item tool was adapted to fit the review objectives. The tailored RTI 14-item tool assessed the selection bias, detection bias, attrition bias, selective outcome reporting, confounding and validity of interpretation of studies (Supplementary Table 1). Possible response categories to each item were combinations of "yes", "no", "partially", "cannot determine", and "not applicable". For ease of interpretation, the categories "cannot determine" and "partially" were collapsed into "unclear risk of bias" category. Agreement between two researchers was assessed by a joint probability agreement. All the discrepancies in opinion were resolved by consensus.

Data analysis

Meta-analysis was not feasible due to significant heterogeneity in study designs, family factors and participation activity types, settings and dimensions measured. There was also incomplete reporting of findings (e.g. in some cases only significant results were reported) and statistics necessary for calculation of Pearson's zero-order correlation coefficients or alternative effect sizes.[30, 31] Attempts to obtain required statistical information resulted in only a few corresponding authors acknowledging the receipt of data requests. Direct combination of standardized regression beta (β) coefficients[30] was not appropriate because of substantial variations in covariates[31] in each multivariate model. Imputation of missing Pearson's zero-order correlations using the existing standardized regression β coefficients[32] was not considered because this approach results in biased findings.[33]

Results were therefore synthesised and interpreted by a single researcher (SA) using a multistage "semi-quantitative" approach.[17, 34] If meta-analysis is not possible such approach is superior to narrative reporting because it provides objective evidence on strength, direction and consistency of associations.[17] Firstly, family factors assessing the same underlying

construct but using different terms to describe it were combined into a single identifying factor (Supplementary Table 2). Secondly, factors were classified into two major groups adapted from previous literature[35, 36]: family "status" and family "process" factors. Thirdly, for family factors examined by two or more studies two parameters were calculated[17, 34]: (a) the number of studies that attempted to establish relationships between family factors and participation, (b) the number of studies that established the relationship as significant ($p<0.05$). Then, the percentage of studies supporting the established relationship with participation was computed by dividing the number of studies that established a significant relationship by the total number possible. From the obtained percentage value, it was determined whether the family factor and participation outcome had a positive or negative association, inconsistent association, or no association. Family factors association for which was supported by ≥60% [17, 34] of studies were considered as factors associated with participation. The rules of classifying the consistency of evidence were adapted from previous research[17, 34] and are summarised in Table 1.

Please insert Table 1 here

RESULTS

Thirty studies were included in the review. The detailed description of characteristics of these studies is supplied in Table 2. Prior to 2010, only six articles[18, 24, 37-40] reporting on four unique samples of children with disabilities met our inclusion criteria. Six studies shared samples,[9, 41-45] but differed substantially in the methodology and sample sub-groups. These were retained as individual studies. Studies were conducted in Europe (9), Canada (7), United States (5), collaboratively between Canada and United States (2), Australia (4), Israel (3). Except four longitudinal studies[24, 43, 44, 46], all studies used cross-sectional design.

Please insert Table 2 here

Quality appraisal

Most of the studies described the study populations and selection in sufficient detail. One study was at high risk of bias due to study subgroups incomparability by age. [47] Eight studies included a convenience sample and were at unclear risk of selection bias (27%). Study sample size ranged from 23 to 77,470 (weighted). None of the studies with a sample size $n \leq 67$[37, 39, 43, 48-50] provided sufficient justification on the adequacy of proposed sample sizes, hence, were rated at unclear risk of bias in external validity and precision. Measures used to collect data on family factors varied (Table 2). Two studies, however, did not provide descriptions on how these data were obtained.[9, 52] Participation was assessed using seven measurement tools (Supplementary Table 3) with the Children's Assessment of Participation & Enjoyment[53] being the most frequently used measure. Six studies did not report on validity and reliability of the participation measures used and were rated at unclear risk of bias.[51, 54-58] Out of four studies with longitudinal designs, one study was at high risk of attrition bias,[43] while the remaining studies provided insufficient information to assess the attrition rate. Six studies provided inadequate adjustment for confounding variables in their analysis and were at unclear risk of bias. Taking into account the individual study's limitations, the findings were considered credible in 24 (80%) and partially credible in six of the included studies (Supplementary Table 4). Nevertheless, no study was excluded from data synthesis. The agreement in the quality appraisal between two researchers was high (78%).

Family factors

This review identified findings in two major groups of family factors: "status" and "process" as illustrated in Figure 2. This taxonomy differentiates modifiable family "process" factors

(what families experience and do) from non-modifiable "status" factors (who families are).[35, 36]

Please insert Figure 2 here

The review distinguished two subgroups of "status" factors: (1) family socio-demographic factors and (2) family structure; and four subgroups of "process" factors: (1) "parental health and well-being", (2) "parental beliefs, perceptions and attitudes", (3) "parental behaviour", and (4) "family resources" (for details on how some factors were collapse into a single identifying factor within each subgroup refer to Supplementary Table 2). Evidence of the measures of association between each factor and participation dimensions, activity domains and settings is summarised in Table 2. Table 3 shows a summary of evidence on the consistency of associations for family factors examined in at least two studies (for the assessment rules refer to Table 1). The sections below describe the main findings. Associations that were studied most often are discussed first.

Please insert Table 3 here

Socio-demographic factors

Family income was studied most frequently, but findings showed inconsistent association with participation (Table 3). Parental education was consistently associated with participation with lower education predicting reduced participation.[9, 40, 45, 48, 59, 60] However, in two studies,[47, 50] higher education predicted reduced participation. Lower socio-economic status [46, 48, 50, 55, 61] was consistently associated with reduced participation. Hispanic ethnicity increased risk for non-participation in organised activities,[55] and having ethnicity other than Caucasian was associated with decreased participation in leisure activities.[24] Indigenous Australian ethnicity

was positively associated with participation in a single study.[46] Parental religion was examined in a single study with no association with participation reported.[50]

Family structure

Family type was studied most frequently. Living in a single-parent family was consistently associated with decreased participation in leisure activities.[40, 55, 62] No study showed a significant association between a number of siblings and participation. Presence of an older or a younger sibling in the household were examined, each in a single study. Relationship was established only between the presence of an older sibling and participation in more household tasks for children with attention deficit hyperactivity disorder (ADHD).[37]

Parental health and well-being

Parental mental health functioning, defined as a state of psychological, social, emotional well-being in which parents can realise their potential and cope with the stresses of life,[63] was the most frequently studied factor and the one consistently associated with participation. Parental stress was associated with reduced participation of children with cerebral palsy in leisure activities.[39, 42, 43] Higher parental stress was also associated with reduced assistance provided to children with ADHD to support their participation.[37] Children of parents with better mental health functioning had better participation in interpersonal relationships.[58] Parental physical functioning was consistently associated with participation, but the direction of associations varied across disabilities. A positive association was established for social participation of children with Down syndrome[58] and a negative association- for participation of children with physical disabilities in recreational activities.[24] Parental quality of life was examined in a single study with a positive association established for participation in informal leisure activities.[43]

Parental beliefs, perceptions and attitudes

Parental self-efficacy beliefs were studied most often showing consistent positive association with participation.[50, 60] Attitudes of family/greater community[41, 64] and parental perceptions of the child's impact on the family[37, 59] were associated with participation inconsistently (Table 3). Parental beliefs about activity and perceptions of activity demands were examined in a single study.[51] Children of parents who shared negative beliefs about activity (e.g. physical activity too overstimulating) and perceived it difficult to make required arrangements for their children participated in fewer physical activities.[51]

Parental behaviour

Supports for the child from parents/greater community was studied most often[18, 41, 57, 62, 64] The presence of parental support was consistently positively associated with participation,[41, 57] except in a single study where the association was negative.[62] Family preferences[18, 19] and activity orientation[18, 19, 43] towards social and recreational activities were positively associated with children's participation in leisure activities. Parental coping behaviour[39, 43] and family relationships (cohesion/conflict)[18, 19] were not related to participation. Parenting style, parents' personal participation, family routines were examined, each in a single study. A positive relationship was established between parental prioritisation of family routines and participation of children with ADHD in household tasks.[37] Negative parenting style[59] and parents' personal participation[43] were not related to participation.

Available Resources

Supports for the family were examined most frequently but no conclusive evidence was found to support an association with participation. Studies examining the effect of parental time availability on participation revealed a consistent positive association.[58, 59] Absence of

financial and time impact on family (measured as a single construct) was examined in a single study with no association with participation eastablished.[18] Another study, however, revealed significant differences between parents of children with disabilities compared to parents of typical peers in respect to finance and time being usually insufficient/inadequate to support their children's participation in the community.[7]

DISCUSSION

This systematic review summarised the evidence for family factors associated with participation of children with disabilities aged 5-12. Family factors identified in the review were grouped according to a taxonomy which distinguishes non-modifiable "status" factors from modifiable "process" factors. "Status" factors consistently associated with participation were parental ethnicity, parental education, family type and socio-economic status. "Process" factors with consistent associations were parental mental and physical health functioning, parental self-efficacy beliefs, parental support, parental time, family preferences and activity orientation. Implications of the key findings are discussed from theoretical, practical and research perspectives.

In line with findings of previous research,[11, 13, 16] this review found consistent relationships between family socio-economic disadvantage, parental mental and physical health functioning and children's participation. There is strong theoretical support[65] for the role of socio-economic disadvantage in influencing children's outcomes through parental mental health and quality of interpersonal relationships. The family stress model[65] suggests that parental psycho-emotional problems (stress, anxiety, depression) triggered or exacerbated by a lack of material resources have a direct negative impact on marital relationships. Accumulated tension from interpersonal problems "splits over" into parent-child interaction

and manifests itself in the form of negative or punitive parenting.[65] Negative parental practices are associated with significant developmental difficulties for children, including behavioural problems, physical health difficulties and problems in interpersonal relationships.[66] These developmental difficulties are linked to reduced participation.[1]

Further, parental mental and physical health problems undermine parents' confidence about their ability to successfully raise children, commonly referred to as parental self-efficacy beliefs.[67] Parents with low self-efficacy beliefs are less likely to adopt effective parenting behaviour[67] and provide safe and positive life situations for their children to participate in.[50] This in turn may reinforce perceptions of low self-efficacy beliefs and increase emotional tension in parents.[67]

It is important to consider that there may be a causal feedback loop. Parental stress and lower self-efficacy beliefs might be caused by having and/or caring for a child with disability. Evidence suggests that parents, especially mothers of children with disability are at increased risk of poor mental[68, 69] and physical health functioning.[69] This is a result of parental lack of ability to cope effectively with stressors caused by the demands of the child's illness.[70]

Given the importance of effective coping strategies in managing daily stressors, developing parental competence and their resilience might be promising targets for family-centred rehabilitation. Further, based on evidence suggesting the effectiveness of direct support strategies in lowering stress levels in families,[71] informing parents and referring them to existing counselling services, social parental networks and respite services are important considerations.

Similar to previous reviews,[11, 17] this review has identified that family preferences and activity orientation are important for children's participation. Families that are better oriented towards intellectual activities and participate more intensely in social-recreational activities create more opportunities for their children's direct involvement in activities[18, 19] and competence development for future participation. Given that parents are the planners of family routines,[20, 72,73] and behaviour is informed by knowledge, beliefs and attitudes,[20, 72] rehabilitation professionals may consider educating parents on the development of consistent family routines oriented towards active participation in recreational activities.

The review found that disadvantaged family circumstances (ethnic minority, material, social and educational deprivation) were associated with reduced participation. These findings were supported by large-scale survey data and are consistent with the results of previous reviews.[11, 13] Social disadvantage appears to affect participation irrespective of children's disability type and health support needs. Socio-economically disadvantaged and single-parent families face greater challenges in meeting the child's and family immediate needs within limited financial and time resources.[74] Limited resources make it harder for parents to provide children with opportunities and experiences. Persistent lack of resources is also disruptive for parental psychological functioning, family cohesive relationships and can results in less affectionate and more aggressive family climate.[65] The latter negatively affects children's well-being[65], their beliefs of what they can accomplish and what they can become.[66]

It appears that disadvantaged families encounter stressors associated with their family situations (financial and time tension, inequalities, limited knowledge, inability to seek for needed services) which affect parental attitudes and behaviour and may account for the risk to children's well-being and participation. While such circumstances are hard to modify,

rehabilitation professionals may monitor disadvantaged families for factors amenable to change. Additionally, improving parental access to information (e.g. informing them of low-cost or free of charge activities), community support programmes, financial service/schemes and childcare funds might ease the financial and time tension placed on families and support participation. Advocacy efforts directed towards promoting the rights of disadvantaged families with childhood disability can also educate local authorities/policy makers and help to create conditions necessary for positive reforms and re-allocation of available resources for social integration and inclusion.

Review findings supported an association between parental support and participation. However, no association with participation was found for other indicators of family dynamics: family relationships (cohesion/conflict), attitudes and parenting style. These findings appear counterintuitive. However, (1) the effect of these factors was not examined extensively, and (2) an absence of direct association does not imply no association. The effect of these factors might be mediated by the other factors directly affecting participation. Positive family dynamics (emotional bond, helpful and encouraging patterns of interaction between family members) is a distinctive feature of cohesive families. Families that display these characteristics participate more in recreational activities[18] which predicts more intense participation.[18] Further, cohesive families exercise effective parenting behaviour which is linked with children's positive development and their social and psycho-emotional functioning[66]- the predictors of more intense participation in leisure actiivties.[18] Rehabilitation professionals can inform and educate parents about the importance of family cohesive relationships, positive parenting, provision of supports and opportunities in facilitating children's abilities to support participation in daily activities.

This review did not find a consistent association between family income and participation. This contradicts previous research[13, 14, 16, 23] and earlier findings of this review that socio-economic disadvantage is a barrier to participation. There is, however, evidence suggesting that income in isolation may not be an effective indicator of economic disadvantage. Low income infers economic disadvantage rather than directly measuring it,[75] and it reveals little about real-life experiences. High-income families can still experience economic disadvantage through uncontrolled consumption or poor distribution of resources.[76] Equally, low-income families may be resource rich or have measures in place to alleviate disadvantage (e.g. through borrowing). It is difficulties meeting needs on available financial resources, gradually accumulating debt and "money worries" what make families economically vulnerable.[77]

Future research

Results were derived from studies having predominantly cross-sectional designs. Prospective studies are needed to confirm findings. Except in six studies, the remaining studies examined participation in leisure and recreational activities. Research on participation in other settings, particularly school, is required. Research modelling the relationships between socio-economic disadvantage, parental mental and physical functioning, children's developmental outcomes and participation using national longitudinal cohort datasets will help to identify and understand the factors across different international contexts. Findings also highlight the need for research on family dynamics and participation. Future research should consider measuring family economic vulnerability alongside family income to allow objective evaluations of economic disadvantage.

Strengths and limitations

This is the first review to systematically examine associations between family factors and participation in children with various disabilities aged 5-12. The review adhered to the PRISMA guidelines to ensure transparency and rigor in methodology. A multistage "semi-quantitative" approach was used to analyse the data, thereby reporting objective evidence on the measures of associations. However, a few limitations should be acknowledged. Participation is a complex construct resulting from a dynamic relationship between a cluster of factors unique to the child, their family and wider environment. This review targeted family/parental factors only and as such did not extract and assess the effect of other factors important to participation. The selection of papers was restricted to those published in peer-reviewed journals in English which might have led to language and publication bias. Substantial heterogeneity in studies, selective reporting of findings and incomplete reporting of essential statistics precluded correlational meta-analysis. The strengthening of standard methods of reporting of observational studies (e.g. STROBE Statement)[78] would improve the ability to compare different studies, and facilitate future meta-analysis.

CONCLUSION

This review emphasised the role of family factors in shaping participation of children with disabilities. Family "status" and "process" factors were associated with participation, with varying effects across disabilities and participation activity domains. It appears that disadvantaged family circumstances shaped by "status" factors may predispose families to variety of stressors. The way parents evaluate and deal with these stressors may adversely affect parental health and well-being, their subjective perceptions and behaviour, which in turn can pose the risk to children's well-being and participation. Family "status" factors are hard to modify, hence, rehabilitation professionals should prioritise "process" factors as primary targets of individually tailored, family-centred interventions. Key "process" factors

for intervention are parental mental and physical health functioning, parental self-efficacy beliefs, parental support, parental time and family preferences and activity orientation. Strategies that can improve families' access to information, counselling services, parental support networks, and/or community support programmes are likely to support children's participation by empowering families and optimizing their health and well-being. Additionally, advocacy efforts promoting the rights of families with childhood disability at local and national level can be helpful in reshaping existing policy interventions to meet families' needs more effectively and thereby improve outcomes for children.

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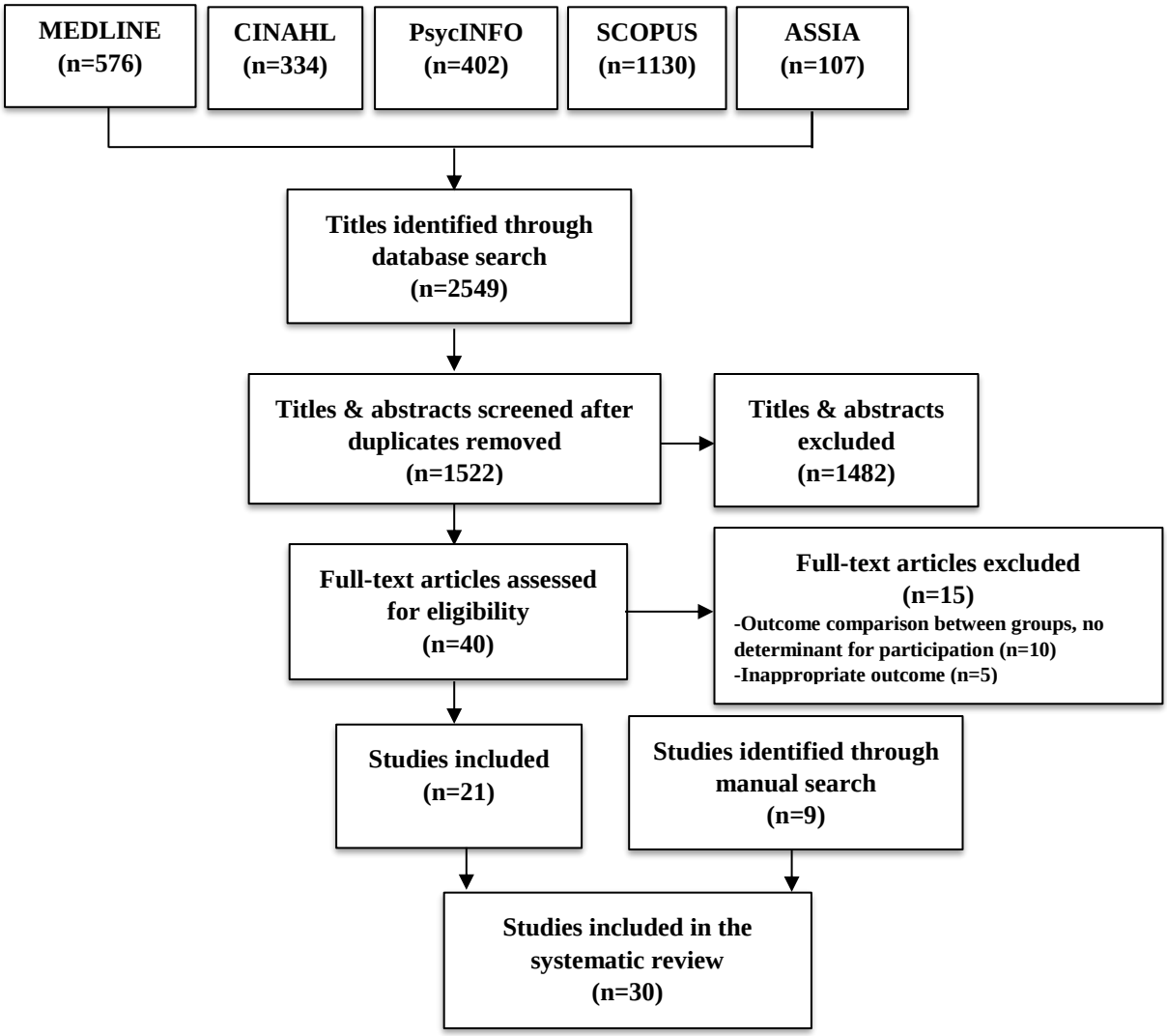

Figure 1: Flow diagram detailing study selection process

Table 1: Rules of classifying the strength of evidence (adapted from Sallis et al., 2000[34])

% of studies supporting association	Coding	Code meaning
0-33	0	No association
34-59	?	Inconsistent association
60-100	+	Positive association
	-	Negative association

Note. Double summary codes: "++", "--", "00" are applied when ≥ 3 studies support a positive/negative association or no association, and "??" is applied when the factor has been studies frequently but findings are inconsistent.

Table 2: Summary of included studies

First author (year)	Country	Study Design	Participant details			Exposure(s) of interest	Exposure(s) measure(s)	Outcome(s) of interest	Outcome(s) measure(s)/ Dimensions	Results
			n (total)	Age range (mean)	Disability type					
Anaby (2014)[a79]	Canada & USA	Cross-sectional	282 (576)	5-17 (11.2)	Mixed disabilities	Family income	Demographic Questionnaire	Home participation, School participation, Community participation	PEM-CY/ Frequency Involvement	Family income was positively associated with participation frequency (β=0.12, $p<0.05$) and involvement (β=0.13, $p<0.05$) at home, and participation frequency (β=0.10, $p<0.05$) and involvement (β=0.12, $p<0.05$) at school. Family income was directly associated with participation involvement (β=0.09, $p<0.05$) in the community and had a significant indirect effect on participation frequency in the community through community barriers.
Axelsson (2013)[47]	Sweden	Cross-sectional	60 (167)	5-20	Profound intellectual & multiple disabilities	Family income, Parental education	Demographic Questionnaire	Family activities	Child-PFA/ Frequency Engagement With whom Personal assistance Technical aid	Family income was negatively correlated with engagement in shopping for groceries activities (r=-0.435, $p<0.01$). Father education was negatively correlated with doing handicraft (r=-0.334, $p<0.05$) and playing outside with adult (r=-0.348, $p<0.05$). Mother education was negatively correlated with doing handicraft (r=-0.561, $p<0.01$), playing board games (r=-0.340, $p<0.05$), laying the table (r=-0.353, $p<0.05$) and doing morning routines (r=-0.303, $p<0.05$).
Bedell (2013)[a7]	Canada & USA	Cross-sectional	282 (576)	5-17 (11.2)	Mixed disabilities	Adequacy of money, Availability of time	PEM-CY	Community participation	PEM-CY/ Frequency Involvement	A significant group differences were found between parents of children and youth with disabilities versus parents of peers without disability in respect to inadequacy of money (chi-square statistics of association 24% vs. 3%, $p<0.00$) and time (chi-square statistics of association 19% vs. 3%, $p<0.001$) in supporting their children's participation in the community.
Bult (2013)[43]	Netherlands	Cohort	46	5-8	Cerebral palsy	Socio-economic status, Parental stress, Parental coping, Personal Participation, Family participation, Family supports,	Parenting Stress Index, Utrecht Coping List, Questionnaire for measuring supports and quality of life, Postal Coding derived from	Leisure participation	CAPE/ Intensity	The feeling of being restricted in family participation when child was aged 2.5 was negatively associated with participation in formal (R^2=12%, $p<0.05$) and informal activities (R^2 =25% $p<0.05$) when child was 6 years old. Parental stress and parental quantity of life measured when child was 2.5 was associated with informal participation only. Socio-economic status, parental coping, familiar support were not predictors of future participation in leisure activities.

						Parental quality of life	Statistics Netherlands			
Cavallo (2015)[54]	Canada	Cross-sectional	4,350[c]	5-14	Arthritis	Family income	PLAS survey	Leisure participation	PLAS survey/ Frequency Diversity	Family income was positively associated with more frequent participation in total leisure activities (β=0.45, 95% CI 0.05-0.86, p<0.05) and informal leisure activities (β=0.47, 95% CI 0.09-0.85, p<0.05). Family income was associated with more frequent participation in physical activities (β=0.75, 95% CI -0.07-1.58), sedentary (β=0.34, 95% CI -0.02-0.70), non-sport skill based (β=0.29, 95% CI -0.36-0.95) and formal activities (β=0.41, 95% CI -0.21-1.03).
Colver (2012)[41]	Europe	Multi-centre cross-sectional	818	8-12	Cerebral palsy	Social supports at home, Attitudes family & friends	European Child Environment Questionnaire	Participation in everyday activities	LIFE-H/ Difficulty with participation	Social supports at home (β=0.35, 95% CI 0.19-0.5, p<0.001) and attitudes of family and friends (β=0.13, 95% CI 0.06-0.19, p<0.001) were positively related to participation in responsibilities. Attitudes of family and friends were positively associated with participation in relationships (β=0.22, 95% CI 0.10-0.33, p<0.001). Supports at home (β=0.35, 95% CI 0.20-0.5, p<0.001) and attitudes of family and friends (β=0.14, 95% CI 0.06-0.23, p=0.001) were related to participation in recreational activities.
Dunn (2009)[37]	USA	Cross-sectional	22 (44)	9-11	Attention deficit hyperactivity disorder	Family routines, Child's impact on the family, Parental stress, Parental sense of competence, Parental education, Number of siblings, Presence of older sibling, Presence of younger sibling	Conners' Parenting Rating Scale Revised Short Form, Family Time & Routine Scale, Parent Stress Index, Parenting Sense of Competence, Demographic Questionnaire	Participation in household tasks	CHORES/ Performance Assistance	Presence of an older sibling (B=2.27, SE (B)=1.13, β=0.29, p=0.04) and higher importance of family routines (B=0.18, SE (B)=0.07, β=0.34, p=0.02) were predictors for diversity of participation in household tasks. Parental stress and presence of an older sibling were predictors for amount of assistance the child's required in participation. Parents' perspectives on parental competence, child's impact on parents, number of siblings, the presence of a younger sibling and parental educational level were not predictors of participation.
Engel-Yeger (2013)[48]	Israel	Cross-sectional	45 (70)	6-11	Hearing/ visual impairments	Parental education, Socio-economic status	Demographic Questionnaire	Leisure participation	CAPE/ Intensity Diversity Enjoyment With whom Where	Parental education was positively correlated with participation in self-improved activities with someone (r=0.48, p<0.01) and outside home (r=0.53, p<0.01) among children with hearing, but not with visual impairments. Socio-economic status was correlated with participation in active physical activities at home (r=-0.49, p<0.05) and with higher enjoyment (r=0.48,

										p<0.05) among children with visual, but not hearing impairments.
Furtado (2015)[64]	Spain	Cross-sectional	102	6-17 (9.98)	Cerebral palsy	Supports from family/community; Attitudes from family/community	Craig Hospital Inventory of Environmental Factors	Participation	SFA/ Level of participation	Supports and attitudes at home and in the community had a very weak effect on school participation.
Houtrow (2012)[55]	USA	Cross-sectional	15,049 (64,076)	6-17	Health related special educational needs	Parental ethnicity, Household poverty status; Family type	NSCH survey	Participation	NSCH survey / Participation in organised activities Working for pay Volunteering	Being of Hispanic ethnicity was associated with increased odds of not participation in organised activities (OR=1.60, 95% CI 1.13-2.28, p<0.05). Living in poverty was associated with participation restriction in organised activities (OR=5.11, 95% CI 3.53-7.39, p<0.05). Living in single-parent household was related with increased odds of not participation in organised activities (OR=1.38, 95% CI 1.07-1.79, p<0.05).
Imms (2009)[38]	Australia	Cross-sectional	108	11.7	Cerebral palsy	Family structure, Socio-economic status	Demographic Questionnaire, Socio-Economic Index derived from Australian Bureau of Statistics	Leisure participation	CAPE &PAC/ Diversity	Socio-economic status was not significantly associated with diversity of participation in informal (B=0.94, 95% CI -0.14-2.02, p=0.09) and in formal (B=0.05, 95% CI -0.38-0.47, p=0.84) leisure activities. There was no association between family structure and participation in leisure.
Kamath (2016)[62]	Canada	Cross-sectional	426	8-14	Epilepsy	Family structure, Parental support, Family income	Social Support Scale, Demographic Questionnaire	Leisure participation	CAPE/ Intensity Diversity	Family structure was positively associated with intensity (β =0.14, p<0.01) and diversity (β =0.12, p<0.05) of participation in leisure activities. Parental social support was negatively associated with diversity of participation in leisure activities (β =-0.09, p<0.05).
Khetani (2014)[49]	USA & Canada	Cross-sectional	23	5 -17 (11.9)	Developmental delay	Family income	Demographic Questionnaire	Community participation	PEM-CY/ Frequency Involvement	Children from families earning higher income participated in community activities more often (d=0.61, p=0.004).
King (2006)[b18]	Canada	Cross-sectional	427	6–14 (10)	Physical disabilities	Family income, Family intellectual-cultural orientation; Family participation in social & recreational activities, Family cohesion, Supportive relationships for the	Demographic Questionnaire, Craig Hospital Inventory of Environmental Factors, IOF Financial Impact Scale, Parent Impact Time Scale,	Leisure participation	CAPE/ Intensity	Family participation in social and recreational activities was associated with participation intensity in informal activities (β =0.18, p<0.05). Family intellectual-cultural orientation (β =0.16, p<0.05) and participation in social and recreational activities (β =0.18, p<0.05) was associated with participation intensity in formal activities. Family cohesion and supportive relationships had significant indirect effect on participation intensity in leisure activities.

						child, Absence of financial and time impact on family	Social Support Scale, Family Environment Scale			
King (2009)[b24]	Canada	Cohort	427	6–14 (10)	Physical disabilities	Family income, Parental ethnicity, Parental physical and mental functioning, Family cohesion, Family active-recreational orientation, Family intellectual cultural-orientation	Demographic Questionnaire, Short Form Health Survey-36, Craig Hospital Inventory of Environmental Factors, Family Environment Scale	Leisure participation	CAPE/ Intensity	Family income was a significant predictor for participation intensity in social activities for children aged 6-8 (β =0.28, $p<0.05$). Being of ethnicity other than Caucasian was related to decline in participation intensity in physical activities (β=0.35, $p\leq0.001$) for children with physical disabilities aged 11-15. Parental physical functioning was a significant positive predictor for decline in participation, but mental health was not.
King (2013)[b81]	Canada	Cross-sectional	427 (781)	6-14 (10)	Physical disabilities	Family income	Demographic Questionnaire	Leisure participation	CAPE/ Intensity Enjoyment	Family income was significantly associated with participation intensity in physical activities (β =0.13, $p<0.05$) and self-improvement activities (β =0.12, $p<0.05$) for children with physical disabilities.
Law (2006)[b40]	Canada	Cross-sectional	427	6–14 (10)	Physical disabilities	Family income, Parental education, Family type	Demographic Questionnaire	Leisure participation	CAPE/ Intensity Diversity	Participation intensity in total leisure ($p=0.007$) and physical activities ($p=0.001$) was lower in children living in a single-parent households. Participation diversity in leisure activities was lower in families with lower income ($p=0.007$), lower parental education level ($p=0.01$) and in children living in a single-parent households ($p=0.002$).
Majnemer (2008)[39]	Canada	Cross-sectional	67	(9.7)	Cerebral palsy	Family coping, Parental stress, Family income	Demographic Questionnaire, Parental Stress Index, Impact on Family Scale	Leisure participation	CAPE/ Intensity Diversity Enjoyment	Parental stress was negatively associated with participation intensity in self-improved activities (β =-0.03, $p<0.017$), and participation diversity in recreational activities (β =-0.05, $p<0.035$). Children for whom parents reported high level of stress were less likely to enjoy most type of activities. Family coping and income were not identified as determinates of participation.
Marquis (2014)[59]	USA	Cross-sectional	63 (161)	6-8	Developmental disability	Maternal education, Maternal hours worked, Parenting stress, Negative parenting, Child's impact on the family	Demographic Questionnaire, Family Impact Questionnaire, Parent-Child Interaction rating System	Sports participation	CBC/ Diversity No of consistent sports, Highest relational sport	Maternal hours worked was negatively associated with a number of sport played by children with and without disabilities aged 6 (β=-0.18, $p<0.05$). Parental education (β=0.20, $p<0.05$) and parents' perception of their children's positive impact on their family (β=0.23, $p<0.05$) were positively associated with number of sport played by all children aged 8.

Masse (2013)[56]	Canada	Cross-sectional	77,470[c]	5-14	Neurodevelopmental disorder	Family income, Familiar assistance	PALS survey	Participation in physical activities, educational activities, social/recreational activities	PALS survey/ Frequency Diversity	Children from lower income families had decreased odds for participation frequency in supervised physical activities (OR=0.42, 95% CI 0.29-0.62, p<0.001), music/art lessons (OR=0.53, 95% CI 0.36-0.79, p=0.002). Familiar assistance was insignificantly related with increased odds for participation frequency in supervised (OR=1.41, p=0.24) and unsupervised (OR=1.91, p=0.053) physical activities.
McCormack (2011)[46]	Australia	Cohort	1041 (4,329)	7 - 9 (8.25)	Communication impairment	Socio-economic status, Indigenous status	Demographic Questionnaire	Activity and Participation based on conceptualisation of the ICF	ALS, ARSLLS, ARSMTS, SDQ, SATI, PPVT-III, MSDQ-III, STRS/ Performance scores on tests	Socio-economic status and Australian indigenous status were significantly associated with participation of children with communication impairments.
Must (2015)[51]	USA	Cross-sectional	53 (111)	3 to 11 (6.6)	Autism spectrum disorder	Parental perception of activity demands; Parental beliefs about activity	Questionnaire developed by the research team	Participation in physical activity	A parent-completed questionnaire/ Intensity Diversity	Children of parents who had negative perception of activity demands (e.g. difficult to make necessary arrangements) and negative beliefs about activities (e.g. too overstimulating for my child) participated in fewer physical activities (p<0.05) and had higher screen time on weekdays (p<0.01) and weekends (p<0.05).
Oates (2011)[58]	Australia	Cross-sectional	208	5-18	Down syndrome	Family income, Parental support, Parental availability of time, Parental physical & mental health functioning	Family Resource Scale, Family Support Scale, Short Form Health Survey-12	Leisure participation	Your Child questionnaire/ Intensity Diversity	Children with better parental mental (OR=1.04, 95% CI 1.01-1.07, p=0.01) and physical health (OR=1.03, 95% CI 1.00-1.07, p=0.03 and more family & community support (OR=1.04, 95% CI 1.01-1.08, p<0.001) had increased odds of having two or more friends. Parental availability of time was associated with increased odds of having 2 or more friends (OR=1.05, 95% CI 1.01-1.09, p=0.01) and having of two or more hobbies (OR=1.05, 95% CI 1.01-1.09, p=0.01). There was not associations between family income and children's participation in friendships, sport and hobbies.
Palisano (2010)[19]	USA	Cross-sectional	288	6-12 (9.8)	Cerebral palsy	Family structure & relationships (organization/ cohesion/conflict), Family activity orientation, Parental education, Family income	Demographic Questionnaire, Family Environment Scale	Leisure participation	CAPE/ Intensity	Family activity orientation is positively associated with intensity of participation in leisure activities (β =0.27, p<0.05). Parental education was indirectly associated with intensity of participation through family activity orientation. Family structure and relationships were indirectly related to participation intensity through child adaptive behaviour. Association between income and participation was very weak and non-significant (β=0.07).

Parkes (2010)[42]	UK	Cross-sectional	102 (928)	8-12	Cerebral palsy	Parental stress	Parent Stress Index	Participation in everyday activities	Life-H & FPQ/ Difficulties with participation Type of assistance required Frequency	Parental stress was associated with decreased odds of children's participation in community activities (OR =0.2, 95% CI 0.1-0.7, p<0.05).
Rekkedal (2017)[57]	Norway	Cross-sectional	167	5-10 grades	Hearing loss	Parental involvement	ICF-CY framework	School participation	ICF-CY/ Attentiveness Involvement	Parental support was moderately correlated with children's social participation and participation in academic activities at school (r=0.25, p≤0.01) and (r=0.40, p≤0.01), respectively.
Rosenberg (2010)[52]	Israel	Cross-sectional	231 (480)	4-6 (5.16)	Mild to moderate developmental disabilities	Family income	Not reported	Participation in everyday activities	CPQ &VABS/ Intensity Diversity Child Independence Enjoyment Parental satisfaction	Children from families with below average income participated in fewer activities compared to those from above average income (μ±SD 35.26±4.30 vrs. 39.21±2.06, p<0.05). Children from below average income had higher participation intensity (μ±SD 4.01±0.36 vrs. 3.82±0.22, p<0.001), were more independent (μ±SD 5.15±0.54 vrs. 4.85±0.53, p<0.05) and enjoyed more (μ±SD 5.47±0.38 vrs. 5.19±0.39, p<0.05) everyday activities compared to peers from families with above average income.
Rosenberg (2013)[60]	Israel	Cross-sectional	78 (188)	4-6 (5.27)	Mild to moderate developmental disabilities	Family income, Maternal education, Maternal self-efficacy beliefs, Parental self-efficacy beliefs	Environmental Restriction Questionnaire, Parental Self-Efficacy Beliefs Questionnaire, Socio-Economic Questionnaire	Participation in everyday activities	CPQ/ Intensity Diversity Child Independence Enjoyment Parental satisfaction	Family income was positively associated with diversity (β =0.27, p<0.0001) and negatively with intensity (β =-0.19, p<0.05) of participation for children with and without disabilities. Maternal self-efficacy beliefs (SEB) were positively associated with participation diversity in everyday activities for children with low process skills (B=1.66, SE=0.45, p=0.0003) and lower independence for children with mild developmental disabilities. Parental SEB were associated with higher enjoyment for all children (β =0.27, p<0.0001). Maternal education, income, maternal SEB, parental SEB made significant contribution of 13-21% to the overall explained variance in participation.
Shields (2015)[61]	Australia	Cross-sectional	286	11.5	Mixed disabilities	Socio-economic status	Index of Relative Socio-Economic Disadvantage	Leisure participation	CAPE & PAC/ Diversity	Socioeconomic status was associated with participation diversity of children with disabilities in out of school leisure activities (B=0.01, 95% CI 0.00-0.02, p<0.03).

Soref (2012)[50]	Canada	Cross-sectional	29 (58)	4.5 -5.9 (5.14)	Mild motor disabilities	Parent self-efficacy beliefs, Parental education, Parental religion, Parental ethnicity, Family structure, Socio-economic status	Parental Self-Efficacy Questionnaire, Socio-Demographic Questionnaire	Participation in everyday activities	CPQ/ Intensity Diversity Child Independence Enjoyment Parental satisfaction	Mother self-efficacy beliefs (β =0.27, $p<0.05$) and socio-economic status (β =0.30, $p<0.05$) predict participation diversity in daily activities. Mother self-efficacy beliefs also predicts participation intensity (β =0.40, $p<0.01$) and child independence (β =0.37, $p<0.01$), and parental satisfaction (β =0.30, $p<0.05$) and child enjoyment (β =0.27, $p<0.05$) when participating. Parental education was negatively associated with parental satisfaction (β =-0.31, $p<0.05$) and child participation enjoyment (β =-0.44, $p<0.001$). Family religion, family structure and ethnicity did not relate to participation.
Tan (2016)[44]	Netherlands	Cohort	424	1-24	Cerebral palsy	Parental education	PERRIN programme	Social participation	VABS/ Intensity	Parental education did not contribute to the variability of the development of social participation.
Ullenhag. (2012)[45]	Sweden, Norway, Netherlands	Cross-sectional	278 (877)	6-17	Mixed disabilities	Parental education	Demographic Questionnaire, Statistics Sweden	Leisure participation	CAPE/ Intensity Diversity	Parental education was positively associated with participation diversity in skilled-based activities (β =0.15, $p<0.05$) and negatively associated with intensity of participation in skilled-based (seldom) (β =-0.15, $p<0.05$) activities.
Ullenhag (2014)[9]	Sweden	Cross-sectional	55 (392)	6-17	Mixed disabilities	Parental education	Not reported	Leisure participation	CAPE/ Intensity Diversity Enjoyment	Parental education was associated with participation diversity in social activities (β =0.12, $p<0.05$) and physical activities (β =0.19, $p\leq0.01$) for children with and without disabilities. Parental education was associated with participation enjoyment in physical activities (β =0.12, $p<0.05$) for all children.

Note. ADL: Activities of Daily Living, IADL: Instrumental Activities of Daily Living, CAPE: Children's Assessment of Participation & Enjoyment, CBC: Child Behaviour Checklist, Child-PFA: Child Participation in Family Activities , CHORES: Children Helping Out: Responsibilities, Expectations and Support, CPQ: Child Participation Questionnaire, Life-H: The Assessment of Life Habits, PEM-CY: Participation & Environment Measure-Children & Youth, SFA: School Function Assessment, VABS: Vineland Adaptive Behaviour Scale, ARSLLS: Academic Rating Scale Language & Literacy Scale, ARSMTS: Academic Rating Scale Mathematical Thinking Scale, ALS: Approach to Learning Scale, SDQ: Strengths & Difficulties Questionnaire, SATI: School-Age Temperament Inventory, PPVT-III: Peabody Vocabulary Test-III, MSDQ-III: Marsh Self-Description Questionnaire-III, STRS: Student-Teacher Relationship Scale.

[a] *Articles reporting on the same sample of children with disabilities.*

[b] *Articles reporting on the same sample of children with disabilities.*

[c] *Weighed sample*

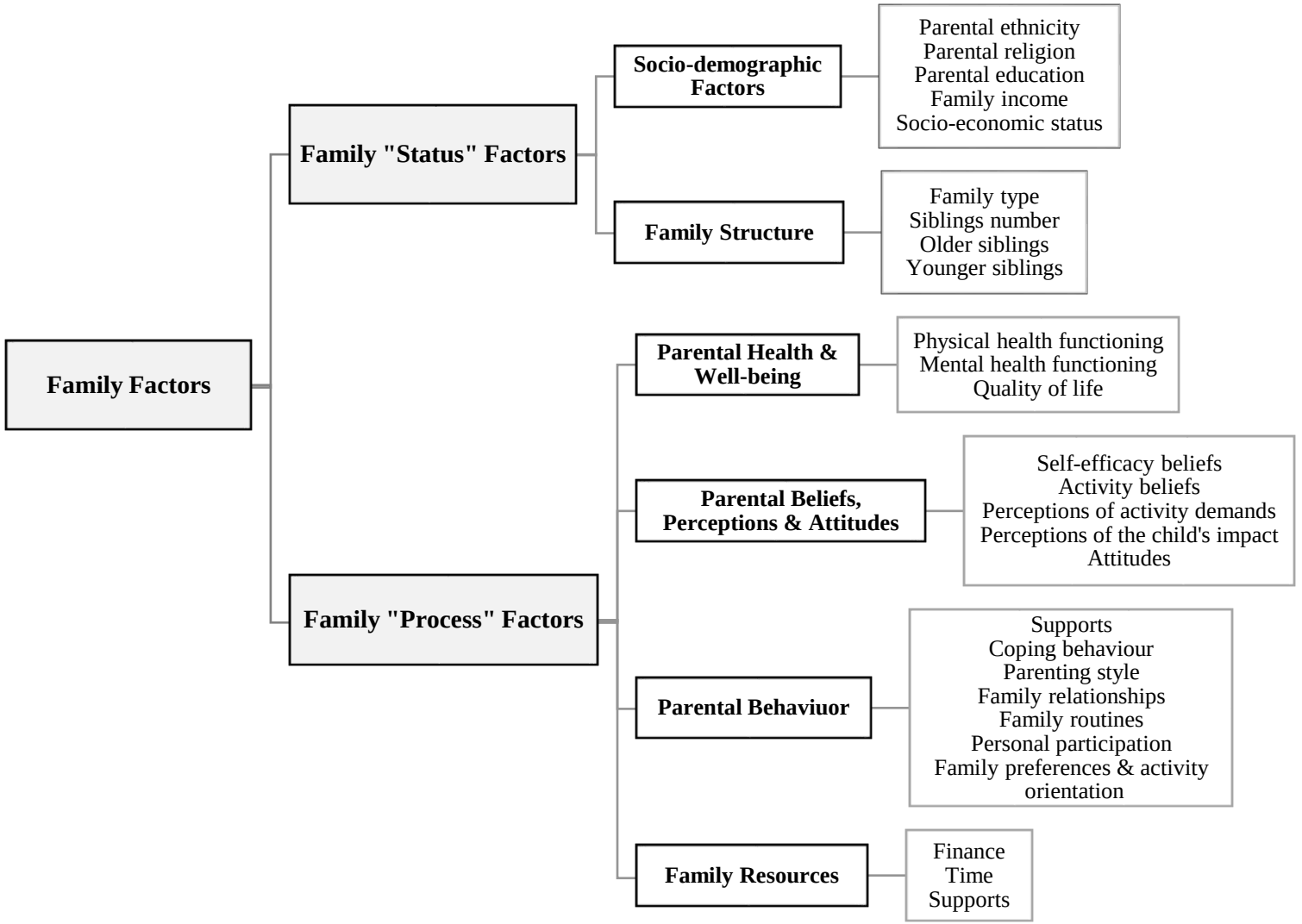

Figure 2: A taxonomy of family factors examined by the included studies

Table 3: **Summary of family factors potentially associated with participation of children with disabilities**

Family factors	No of studies[a]	Related to participation		Not related to participation	Coding	
		No of studies[b]	Direction of assoc.[c]	No of studies[d]	% of studies supporting assoc.[e]	Assoc.[f]
Family "Status" Factors						
Family Socio-demographic Factors						
Family income[*]	12	7[40, 47, 49, 52, 54, 60, 79]	+	5[19, 39, 56, 58, 61]	7/12=58%	??
Parental education	11	8[9, 40, 45, 47, 48, 50, 59, 60]	+	3[19, 37, 44]	8/11=73%	++
Socio-economic status	7	5[46, 48, 50, 55, 61]	+	2[38, 43]	5/7=71%	++
Parental ethnicity	4	3[24, 46, 55]	-	1[50]	3/4=75%	-
Family structure						
Family type (single-parent)	5	3[40, 55, 62]	-	2[38, 50]	3/5=60%	--
Number of siblings	2			2[37, 58]		0
Family "Process" Factors						
Parental Health & Well-being						
Mental health functioning	7	5[37, 39, 42, 43, 58]	+	2[24, 59]	5/7=71%	++
Physical health functioning	2	2[24, 58]	+/-		2/2=100%	+/-
Parental Beliefs, Perceptions & Attitudes						
Self-efficacy beliefs	3	2[50, 60]	+	1[37]	2/3=67%	+
Attitudes	2	1[41]	+	1[64]	1/2=50%	?
Perception of child's impact	2	1[59]	+	1[37]	1/2=50%	?
Parental Behaviour						
Supports (for the child)	5	3[41, 57, 62]	+	2[18, 64]	3/5=60%	++
Family preferences & activity orientation	2	2[18, 19]	+		2/2=100%	++
Family relationships	2			2[18, 19]		0
Coping behaviour	2			2[39, 43]		0
Family Resources						
Supports (for the family)	3	1[58]	+	2[43, 56]	1/3=33%	0
Time	2	2[58,59]	+		2/2=100%	+

Note. [a] *The number of studies examined a particular association.*
[b] *The number of studies established an association as being significant ($p<0.05$).*
[c] *The prevailing direction of an association based on the frequency count.*
[d] *The number of studies that established an association as being insignificant.*
[e] *The percentage of studies supporting an association.*
[f] *Double summary codes "++", --" were applied when ≥ 3 studies supported a positive or negative association and "??" when the factor was studies frequently but findings were inconsistent. Code "+/-" was applied when studies differed in respect to the direction of established association.*
[*] *Thirteen studies examined the effect of income on participation, but two studies shared the sample of children with disabilities (i.e. Law et al., 2006 and King et al., 2013), hence, were counted as one study.*

Supplementary Figure 1: Search Strategy

Database: MEDLINE (1st January 2001 to 26th of September 2017)

S52	**S9 AND S12 AND S32 AND S42 AND S49 (Limiters - Date of Publication: 20010101-20170926 Narrow by Language: English)**
S51	S9 AND S12 AND S32 AND S42 AND S49 (Limiters - Date of Publication: 2001-2017)
S50	S9 AND S12 AND S32 AND S42 AND S49
S49	S47 OR S48
S48	TI “cohort stud*” OR TI “longitudinal stud*” OR TI “prospective stud*” OR TI “cross-sectional stud*” OR TI “case-control stud*” OR TI model* OR AB “cohort stud*” OR AB “longitudinal stud*” OR AB “prospective stud*”OR AB “cross-section stud*” OR AB “case-control stud*” OR AB model*
S47	S43 OR S44 OR S45 OR S46
S46	(MM "Case-Control Studies+")
S45	(MM "Cross-Sectional Studies")
S44	(MM "Longitudinal Studies+")
S43	(MM "Cohort Studies+")
S42	S38 OR S41
S41	S39 OR S40
S40	AB participat* OR AB engage* OR AB involve* OR AB “life N/2 situations” OR AB “human activit*” OR AB “leisure activit*”
S39	TI participat* OR TI engage* OR TI involve* OR TI “life N/2 situations” OR TI “human activit*” OR TI “leisure activit*”
S38	S33 OR S34 OR S35 OR S36 OR S37
S37	(MM "Recreation+")
S36	(MM "Leisure Activities+")
S35	(MM "Activities of Daily Living+")
S34	(MM "Community Participation+")
S33	(MM "Social Participation")
S32	S16 OR S31
S31	S26 OR S30
S30	S27 OR S28 OR S29
S29	TI “socioeconom* factor*” OR TI “family income” OR TI “finance* vulnerab*” OR AB “socioeconom* factor*” OR AB “family income” OR AB “finance* vulnerab*”
S28	AB “home environ*” OR AB “ family environ*” OR AB “family context” OR AB “family factor*” OR AB “family predictor*” OR AB “family N/1 character*” OR AB “residence character*” OR AB “family health” OR AB “parent* health” OR AB “family N/1 relation*” OR AB “interperson* relation*”
S27	TI “home environ*” OR TI “ family environ*” OR TI “family context” OR TI “family factor*” OR TI “family predictor*” OR TI “family N/1 character*” OR TI “residence character*” OR TI “family health” OR TI “parent* health” OR TI “family N/1 relation*” OR TI “interperson* relation*”
S26	S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25
S25	(MH "Socioeconomic Factors+")
S24	(MM "Social Support+")
S23	(MM "Interpersonal Relations+")
S22	(MH "Family Relations+")
S21	(MM "Family Health")
S20	(MH "Residence Characteristics+")
S19	(MH "Family Characteristics+")
S18	(MM "Social Environment+")
S17	(MM "Parenting")
S16	S13 OR S14 OR S15
S15	AB famil* OR AB parent* OR TI famil* OR TI parent*
S14	(MM "Parents+")
S13	(MM "Family+")
S12	S10 OR S11
S11	TI child* OR TI girl* OR TI boy* OR TI schoolchild* OR AB child* OR AB girl* OR AB boy* OR AB schoolchild*
S10	(MM "Child")
S9	S7 OR S8
S8	TI disab* OR TI “special N/1 needs” OR AB disab* OR AB “special N/1 needs”
S7	S1 OR S2 OR S3 OR S4 OR S5 OR S6
S6	(MH "Communication Disorders+")
S5	(MH "Intellectual Disability+")
S4	(MM "Developmental Disabilities")
S3	(MM "Motor Skills Disorders")
S2	(MH "Disabled Persons+")
S1	(MM "Disabled Children")

Supplementary Table 1: RTI 14-item bank

Domains	Items	Criteria
Sample definition and selection	I_1	Inclusion/exclusion criteria clearly stated
	I_2	Inclusion/exclusion criteria: measures valid and reliable
	I_3	Inclusion/exclusion criteria: applied uniformly
	I_4	Sufficient sample size
Creation of exposure groups	I_5	Selection of the comparison group is appropriate
Soundness of information	I_6	Exposures assessed using valid and reliable measure
	I_7	Outcomes assessed using valid and reliable measures
Follow-up	I_8	Length of follow-up is the same for all groups
	I_9	Attrition from any group exceeds 30% percent
	I_{10}	Attrition differs between the groups by more than 20%
Analysis comparability	I_{11}	Confounding and effect modifying variables are accounted for
Analysis outcome	I_{12}	If high loss to follow-up: the impact assessed
Appropriate analytic method	I_{13}	Any primary outcomes are missing from the results
Interpretation	I_{14}	Results believable taking limitations into account

Supplementary Table 2: Factors combined into a single identifying factor

Family factors Factors (domain(s) measured)	Single Identifying Factor
Household poverty status Socio-economic status Socio-economic disadvantage	Socio-economic status
Family structure Family type Single-parent status	Family type
Parental stress (psychological well-being) Parental mental health functioning (psychological/emotional/social well-being)	Mental health functioning
Parental self-efficacy beliefs Mother self-efficacy beliefs Parental sense of competence (perception of role/efficacy)	Self-efficacy beliefs
Attitudes (family/friends) Attitudes (home/community)	Attitudes
Social support at home Parental support Parental involvement Supports (parent/community) Supports (home/community)	Supports (for the child)
Family structure & relationships (organisation/conflict/cohesion) Family cohesion	Family relationships
Family intellectual-cultural orientation (preferences for intellectual activities) Family active-recreational orientation (participation in recreational activities)	Family preferences & activity orientation
Financial impact Adequacy of money	Financial resource
Availability of time Maternal hours worked Time impact	Time resource
Family support Familiar assistance Family social support	Supports (for the family)

Supplementary Table 3: Description of validated tools applied to measure participation

Participation Measure	Population	Age range	Respondent	Participation Focus	Main Domains	Studies [ref. no]
CAPE	Children and youth with & without disabilities	6-21	Child	Leisure & recreation activities	Recreational Physical Social Skills-based Self-improvement	9, 18, 19, 24, 38-40, 43, 45, 48, 61, 62, 80
CBC		6-18	Parent/caregiver	Child competencies & problems	Social Functioning Mood &Anxiety Symptoms Externalising Symptoms	59
Child-PFA	Children with & without disabilities			Family activities	Indoor Meal Routine Outdoor Outings Organised activities Vacation & holidays	47
CHORES	Children with & without disabilities	6-11	Parent/caregiver	Domestic activities	Self-care Family care	37
CPQ	Children with & without disabilities	4-6	Parent/caregiver	Everyday activities	ADL IADL Play Leisure Social participation Education	50, 52, 60
Life-H	Children with disabilities	5-13	Parent/caregiver	Everyday activities	Daily activities: Mealtimes Health hygiene Personal care Home life Mobility Social roles: Recreation Responsibility Education Relationships	41, 42
PEM-CY	Children & youth with & without disabilities	5-17	Parent/caregiver	Home, school & community activities alongside the environmental factors within each setting	Participation items: Home School Community Environmental items: Home School Community	7, 49, 79
SFA	Children with & without disabilities	5-12	Teacher/health professional	School activities	Participation Activity support Activity performance	64
VABS	Children with disabilities	0-18	Parent/caregiver	Adaptive behaviour	ADL Communication Motor skills Socialisation	44, 52

Note. ADL: Activities of Daily Living, IADL: Instrumental Activities of Daily Living, CAPE: Children's Assessment of Participation & Enjoyment, CBC: Child Behaviour Checklist, Child-PFA: Child Participation in Family Activities , CHORES: Children Helping Out: Responsibilities, Expectations and Support, CPQ: Child Participation Questionnaire, Life-H: The Assessment of Life Habits, PEM-CY: Participation & Environment Measure-Children & Youth, SFA: School Function Assessment, VABS: Vineland Adaptive Behaviour Scale.

Supplementary Table 4: Quality appraisal based on the customized RTI 14-item bank

First Author(year) [ref. no]	Sample definition and selection				Creation of exposure groups	Soundness of information		Follow-up			Analysis comparability	Analysis outcome	Appropriate analytic method	Interpretation
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}	I_{11}	I_{12}	I_{13}	I_{14}
Axelsson (2013)[47]	x	x	-	x	-	x	x	*	*	*	?	*	x	?
Bedell (2013)[7]	x	?	x	x	x	x	x	*	*	*	x	*	x	x
Bult (2013)[43]	x	x	*	?	*	x	x	*	-	*	?	-	x	?
Cavallo (2015)[54]	x	x	*	x	*	x	?	*	*	*	?	*	x	x
Colver (2012)[41]	x	x	*	x	*	x	x	*	*	*	x	*	x	x
Dunn (2009)[37]	x	?	x	?	x	x	x	*	*	*	x	*	x	?
Engel-Yeger (2013)[48]	x	?	x	?	?	x	x	*	*	*	?	*	x	?
Furtado (2015)[64]	x	?	*	x	*	x	x	*	*	*	x	*	x	x
Houtrow (2012)[55]	x	x	*	x	*	x	?	*	*	*	x	*	x	x
Imms (2009)[38]	x	x	*	x	*	x	x	*	*	*	x	*	x	x
Kamath (2016)[62]	x	x	*	x	*	x	x	*	*	*	x	*	x	x
Khetani (2014)[49]	x	?	*	?	*	x	x	*	*	*	?	*	x	?
Law (2006)[40]	x	x	*	x	*	x	x	*	*	*	x	*	x	x
King (2013)[80]	x	x	x	x	x	x	x	*	*	*	x	*	x	x
Majnemer (2008)[39]	x	x	*	?	*	x	x	*	*	*	x	*	x	x
Marquis (2014)[59]	x	x	x	x	x	x	?	*	*	*	x	*	x	x
Masse (2013)[56]	x	x	x	x	x	x	?	*		*	x	*	x	x
McCormack (2011)[46]	x	x	x	x	?	x	x	x	?	?	x	?	x	x
Must (2015)[51]	x	x	x	x	x	?	?	*	*	*	?	*	x	x
Oates (2011)[58]	x	x	*	x	*	x	?	*	*	*	x	*	x	x
Palisano (2010)[19]	x	x	*	x	*	x	x	*	*	*	x	*	x	x
Parkes (2010)[42]	x	x	*	x	*	x	x	*	*	*	x	*	x	x
Rekkedal (2017)[57]	x	x	*	x	*	x	?	*	*	*	x	*	x	x
Rosenberg (2010)[52]	x	?	x	x	x	?	x	*	*	*	x	*	x	x
Rosenberg (2013)[60]	x	?	x	x	x	x	x	*	*	*	x	*	x	x
Shields (2015)[61]	x	x	*	x	*	x	x	*	*	*	x	*	x	x
Soref (2012)[50]	x	?	x	?	x	x	x	*	*	*	x	*	x	?
Tan (2016)[44]	x	x	*	x	*	x	?	*	?	*	x	?	x	x
Ullenhag (2012)[45]	x	x	x	x	x	x	x	*	*	*	x	*	x	x
Ullenhag (2014)[9]	x	x	x	x	x	?	x	*	*	*	x	*	x	x

Note. I Item, "x" Low risk of bias, "-" High risk of bias, "?" Unclear risk of bias, "" Not applicable*